

NOTES ON THE LIFE HISTORIES OF NORTH AMERICAN  
CATOCALAE, WITH DESCRIPTION OF TWO NEW  
FORMS.

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In offering the following notes on the early stages of a number of species of Catocalae I wish to state that breeding experiments conducted by me during the past two seasons bring me to the conclusion that *C. gracilis* Edwards and *C. sordida* Grote are distinct species, and that both are closely allied to *C. andromedae* Guenée.

Barnes and McDunnough, in the classification of this genus (1917, Check List), have placed *andromedae* directly after *gracilis*, and, they say in part (1918, Illustrations of North American Catocalae, p. 36) "that the similarity of the maculation of the primaries as well as structural characters of the two species leads to this belief." Subsequently my friend Mr. C. Rummel (1919, BULL. BROOKLYN ENT. SOC., XIV, p. 103) accidentally came across the larvae of both species on the same food plant; and my breeding experiments are conclusive proof of the correct association of the two.

I take this opportunity of expressing my thanks to Messrs. J. B. and C. J. Paine, of Boston, who have very kindly furnished me with ova of various species.

*Catocala andromedae* Guenée.

*Ovum*.—Rather more than hemispherical; strongly ribbed vertically with about 28 ribs arising at base of egg, about 17 of which reach the micropylar area, the remainder extending only slightly above the equatorial zone and rarely branching; micropyle composed of very minute cells encircled by a rather irregular row of slightly larger cells surrounded by a slightly raised rim; base flat; color brown, with a narrow, well-defined circumferent band of yellowish encircling the egg just above the equatorial region. There is considerable color variation in the ova, even from the same female, the color ranging from a yellowish to a purplish brown, with the darker shades predominating. Diameter, 1.2 mm.

*Larva*.—Stage I.—Head ochreous. Body greenish yellow with faint yellowish brown longitudinal lines, most strongly pronounced on the last four abdominal segments; tubercles brown, inconspicuous, with sparse setae; ventral surface with the usual dark patches well pronounced. Length, 4.5 mm.

Stage II.—Head ochreous, lined longitudinally with brown. Body gray, with two pale lateral stripes edged with the brown lines of preceding stage, and a similar rather indistinct spiracular stripe; a pale geminate dorsal stripe enclosing dark patches; fifth abdominal segment darker than others and slightly swollen dorsally; tubercles black, encircled by a dark band at base; ventral surface with the dark patches on each segment. Length, 9.5 mm.

Stage III.—Head whitish, marked frontally with longitudinal brown lines; sides of lobes striated with pale brown. Body ochreous, with three pale lateral lines edged with brown, and similar subdorsal and subspiracular lines; the area between the subdorsal and upper lateral lines is darker than the general color of body, as is also the subspiracular area; dorsal area with pale geminate line enclosing indistinct diamond patches of brown; fifth abdominal segment with dorsal wart of dark brown tipped with orange, dark brown transverse patch posterior to this wart extending to sublateral area; dorsal tubercles on seventh and eighth abdominal segments tipped with orange, very prominent on eighth segment with a dark brown oblique dash behind; other tubercles black; ventral area whitish with the usual brown patches on each segment. Length, 17 mm.

Stage IV.—Very similar to the preceding stage, but with the lines more contrasting; dorsal tubercles orange; wart on fifth abdominal segment very prominent, dark brown tipped with orange shaded laterally with paler brown; sparse whitish lateral filaments present. Length, 23 mm.

Stage V.—Head whitish shaded with orange at apex, lined longitudinally with brown, the most prominent of which are a more or less geminate line descending from the prothorax over apices of lobes to mouth parts paralleled inwardly with a similar line terminating a little below apex of clypeus; and a border line arising at the palpi ascending to apex of lobes which are heavily striated with brown. There is a dark streak through center of clypeus. Body gray; lines as in stage III, but a trifle more pronounced than in preceding stage owing to the more contrasting border lines; the dark subdorsal area accentuating the dorsal patches; wart on fifth

abdominal segment not as prominent as in preceding stage, dark orange shaded posteriorly with paler color and gradually diminishing as the larva approaches maturity; dorsal tubercles orange encircled with whitish at base, other tubercles whitish; the oblique dash behind tubercle II of eighth abdominal segment is scarcely distinguishable; sparse whitish lateral filaments; ventral surface greenish white, patches brown. Length, full grown, 45 to 50 mm.

*Food plant*.—Various species of Huckleberry (*Vaccinium* spp.).

*Catocala gracilis* Edwards.

This description is drawn up from ova secured from a number of females captured at Lakehurst, N. J., including both *gracilis* and *sordida* forms. No effort was made to separate the two forms and all the ova were put together; subsequently after rearing the larvae through the third stage I discovered that two species evidently were involved. Fortunately the larvae all emerged at practically the same time, thus rendering separation a comparatively easy matter. This was promptly done and from then on the larvae were bred apart.

Further breeding experiments from authoritatively identified females will therefore be necessary to fully establish the ovum and first three larval stages.

I am appending herewith the full notes as recorded which will tend to show the close relationship this species bears to *andromedae*.

*Ovum*.—Strikingly similar to that of *andromedae*; in fact, so much so as to be scarcely distinguishable; it is, however, a trifle smaller, and viewed laterally tapers slightly from the equatorial region toward apex; the yellowish circumferential band is broad and irregular and does not completely encircle the egg as is the case with *andromedae*. This character seems to be constant. The same color variations have been observed as in *andromedae*. Diameter, .9 mm.

*Larva*.—Stage I.—Head brown. Body greenish gray with three brown lateral lines; tubercles brown with short setae; ventral surface with the dark patches rather enlarged. This larva closely resembles the young larva of *andromedae*, being a trifle smaller and darker in general color. Length, 4 mm.

Stage II.—Head whitish with longitudinal brown lines. Body dark greenish gray with three brown lateral lines and a

similar subspiracular line; a rather indistinct, geminate, pale dorsal line; tubercles black with short setae; patches on ventral surface contiguous. Length, 8 mm.

Stage III.—Head whitish with dark brown lines, most prominent of which is a broad lateral line arising at apices of lobes, diminishing to a hair line at palpi, and a dark dash above apex of clypeus. Body greenish, with two pale lateral lines edged with brown and a similar spiracular line; a pale geminate dorsal line edged with brown enclosing light and dark patches; a broad brown black transverse patch on posterior of fifth abdominal segment (this segment is slightly swollen dorsally), extending down between the prolegs; the greenish ground color each side of this patch is lighter in color than rest of body, making the transverse patch stand out very prominent; the subdorsal area has the appearance of a dark stripe, edged with dark brown lines; these are the border lines of the dorsal and upper lateral lines and are confluent on posterior edge of first four abdominal segments forming conspicuous, arrow-like spots with the apex to posterior of body; a broad black crescent on eleventh segment behind tubercle II; tubercles black; ventral area with dark brown contiguous patches; legs brown; prolegs whitish, conspicuous, with a dark brown lateral line. There is considerable color variation in different individuals, the general color ranging from greenish to a warm yellowish brown. It is also noted that the lines on head do not appear to be constant, nor are the ventral spots always connected. The head of some individuals is as above described, while others have a dark furcate border line arising at palpi, ascending to apices of lobes. Length, 15 mm.

The differences noted in stage III, in the lines of the head and of the ventral spots, seemed to indicate that two species were involved, but not until after the third moult, when some of the larvae showed the presence of lateral filaments, while others had no trace of any, was there conclusive evidence that two species were under observation. After the larvae had been separated according to the presence or absence of the filaments it was at once observed that the inconstancy of the head lines and of the ventral spots had also devolved into two forms, the one with the filaments and the other without this characteristic feature. This established beyond doubt two distinct species; close observation was then made of both forms.

*C. gracilis* Edwards.

Stage IV.—Head whitish, with a dark brown furcate line beginning at palpi ascending along border of lobes, evanescent at apices; a dark line arising slightly above the region of the ocelli ascending toward lobes, angled inward, and terminating in an obtuse hook near apex of lobe. Body gray, sprinkled with brown dots; a pale geminate dorsal line enclosing light and dark patches of brown through which runs a darker centro-dorsal line; a dark subdorsal stripe edged with dark lines coalescing on posterior of first four abdominal segments, forming dark sagittate spots similar to those of the preceding stage but less pronounced; just below tubercle II is a broad lateral stripe filled with indistinct wavy lines; below spiracles a pale geminate line; subspiracular area darker than above; small ochreous wart dorsally on fifth abdominal segment posterior to which is a broad brown black transverse patch; tubercle II of eighth abdominal segment prominent with the usual oblique dash behind it; ventral area greenish white with dark brown patches on each segment; sparse whitish lateral filaments present. Length, 22 mm.

Stage V.—Head as in preceding stage but slightly tinged with ochreous apically. Body brown covered with blackish dots; lines of preceding stage present but less distinct owing to the heavy sprinkling of the dark dots; the transverse patch on the fifth abdominal segment is only faintly visible; the wart on this segment small, ochreous; tubercle II prominent, especially so on fifth, eighth and ninth body segments, reddish tipped with orange and with a white spot dorsally at base; other tubercles ochreous arising from a whitish base; the oblique dash behind tubercle II on eighth abdominal segment quite pronounced; prolegs concolorous with body; ventral surface whitish tinged with green, brown patches on each segment; sparse lateral filaments. The full-grown larva intimately resembles that of *andromedae*. Length, full grown, 45 to 50 mm.

*Food plant*.—Huckleberry (*Vaccinium*).

*Catocala sordida* Grote.

As already noted, further breeding experiments will be necessary to distinguish the earlier stages from that of *gracilis*; the ovum and first three larval stages are very similar; the last two stages, however, show decided points of distinction, amply proving the species to be entitled to specific rank.

*Larva*.—Stage IV.—Head whitish with a dark brown lateral line, broadest at apex of lobes, broken into striations at the epicranium; frontally a dark longitudinal line arising in the region of the ocelli ascending to apex of lobes, and a well-defined line subparallel with clypeus branching near apex of same, merging with the longitudinal line outwardly, the inner branch ascending irregularly to prothorax; a dark central dash through lower portion of clypeus and a streak along suture dividing the lobes. Body gray, heavily sprinkled with brown dots; a pale geminate dorsal line enclosing light and dark patches, lightest on posterior edge of segments, the dorsal area appearing as a light streak, paralleled by a dark subdorsal stripe edged with darker lines, coalescing on posterior of segments, forming dark brown sagittate markings with apex to posterior of body; below this are two light geminate wavy lateral lines, and a dark wavy spiracular stripe with a darker line along upper edge; subspiracular area darker than above and with darker deltoid patches on each segment; prominent light brown dorsal wart on fifth abdominal segment, a dark brown transverse patch on posterior of this segment usually extending to anterior portion of sixth abdominal segment; this dark patch is relieved on either side by extremely light patches, making the darker patch stand out very prominent; a dark crescent always present posterior to tubercle II on eighth abdominal segment; tubercles orange; prolegs whitish, conspicuous; ventral area whitish with the dark patches contiguous; no filaments. During this stage considerable color variation appears in different individuals, which increases as the larvae approach the end of the instar and begin to bear the markings which they carry to maturity. Length, 18 mm.

Stage V.—Head small, whitish tinted with orange at apices of lobes; lines much as before faintly striated at apex and sides of lobes. Body color ranges from a pale ochreous to gray, heavily sprinkled with dark dots, making the general color range from ochreous through yellowish browns to almost a brown black or dark gray; the lines, however, are constant though varying in color with the body color and are less distinct than in preceding stage; this is the most variable larvae the writer has observed with the possible exception of the *Myrica*-feeders; there is always present a dark subdorsal stripe bordered by darker lines; this stripe is very conspicuous on thoracic segments, being accentuated by the light dorsal area and the more or less broken lateral stripe of pale color which in some instances is almost white on fourth, fifth and

sixth abdominal segments, these light patches often extending to the subspiracular area; the subspiracular area is darker than above with the triangular patches as in preceding stage; wart on fifth abdominal segment small, usually orange, posterior to which and anteriorly on sixth segment is the dark transverse patch of preceding stage extending down between the prolegs; this dark patch is always well pronounced, ranging in color from brown in the light forms to almost black in the darker forms; tubercles ochreous to orange; tubercle II of eighth abdominal segment prominent, with a dark crescent behind; ventral surface whitish with dark brown contiguous patches; prolegs whitish, conspicuous, with dark lateral lines; no filaments. Length, full grown, 42 to 45 mm.

*Food plant.*—Various kinds of Huckleberry (*Vaccinium* spp.).

(*To be continued.*)

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## DISTRIBUTIONAL RECORDS OF AQUATIC HEMIPTERA.

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Collectors and students of Hemiptera, while more numerous now than ten years ago, are still but too few; and the published distribution of the Heteroptera is still far too fragmentary to base generalizations upon. The records here given are from specimens in the Cornell University collection, and fill gaps in the distribution, not only in New York, but also in the United States at large. For convenience, the arrangement is according to Van Duzee's *Catalogue*:

*Mesovelia bisignata* Uhler—Ithaca, N. Y.

*Gerris conformis* Uhler—Ithaca, N. Y.

*Gerris marginatus* Say—NEW YORK: Ithaca, Old Forge, Adirondack Mts.; MICHIGAN: Walnut Lake.

*Gerris buenoi* Kirkaldy—Ithaca, N. Y.; Lake Forest, Ills. These two States are not given by Van Duzee.

*Gerris canaliculatus* Say—Knoxville, Tenn. Another record additional.

*Gerris rufoscutellatus* Latreille—NEW YORK: Ithaca, Enfield Falls, Old Forge; CALIFORNIA: Mt. Diablo, Fresno Co.,